CLAIMS

We Claim:

1. A process for protecting catalytic activity of a silicoaluminophosphate molecular sieve, comprising the steps of:

a) regenerating silicoaluminophosphate molecular sieve catalyst particles to contain less than about 1% coke by weight relative to a weight of molecular sieve material within the regenerated catalyst particles; and

b) mixing the regenerated catalyst particles with coked catalyst particles containing at least 2% coke by weight relative to a weight of molecular sieve material within the coked catalyst particles to maintain the catalytic activity of the mixed catalyst particles at a predetermined level.

2. The process of claim 1, wherein the regenerated catalyst particles are mixed at a temperature of less than 550°C.

3. The process of claim 1, wherein the regenerated catalyst particles are mixed at a temperature from about 400°C to about 550°C.

4. The process of claim 1, further comprising cooling the regenerated catalyst particles prior to mixing with the coked catalyst particles.

5. The process of claim 1, wherein the regenerated catalyst particles are cooled by contacting the regenerated particles with steam.

6. The process of claim 1, wherein the regenerated catalyst particles are regenerated in a regenerator that is part of a reactor system for converting hydrocarbons to olefins.

7. The process of claim 6, wherein the regenerated catalyst particles are mixed with coked catalyst particles in a fluidized bed within a reactor.

8. The process of claim 6, wherein the regenerated catalyst particles are mixed with coked catalyst particles prior to introducing the regenerated catalyst particles into a fluidized bed within a reactor.

9. The process of claim 1, wherein the coked catalyst particles contain from about 2% to about 18% coke by weight relative to the weight of molecular sieve material within the coked catalyst particles.

10. The process of claim 1, wherein the coked catalyst particles contain from about 7% to about 13% coke by weight relative to a weight of molecular sieve material within the coked catalyst particles.

11. The process of claim 1, wherein the regenerated catalyst particles contain less than 0.2% coke by weight relative to a weight of molecular sieve material within the regenerated catalyst particles.

12. The process of claim 1, wherein a lifetime of the mixed catalyst particles corresponds to a cumulative grams of methanol converted per gram of sieve value of about 10, and wherein a catalytic activity of the mixed catalyst particles is maintained at above 80% conversion of methanol to olefin at a cumulative grams of methanol converted per gram of sieve value of 5.

13. The process of claim 1, wherein a lifetime of the mixed catalyst particles corresponds to a cumulative grams of methanol converted per gram of sieve value of about 10, and wherein a catalytic activity of the mixed catalyst particles is maintained at above 90% conversion of methanol to olefin at a cumulative grams of methanol converted per gram of sieve value of 5.

14. The process of claim 1, wherein a catalytic activity of the mixed catalyst particles is maintained at above 80% conversion of methanol to olefin at a cumulative grams of methanol converted per gram of sieve value corresponding to half of a catalyst particle lifetime.

15. The process of claim 1, wherein a lifetime of the mixed catalyst particles corresponds to a cumulative grams of methanol converted per gram of sieve value from about 20 to 30, and wherein a catalytic activity of the mixed catalyst particles is maintained at above 80% conversion of methanol to olefin at a cumulative grams of methanol converted per gram of sieve value from about 10 to 15.

16. The process of claim 1, wherein a lifetime of the mixed catalyst particles corresponds to a cumulative grams of methanol converted per gram of sieve value from about 40 to 50, and wherein a catalytic activity of the mixed catalyst particles is maintained at above 80% conversion of methanol to olefin at a cumulative grams of methanol converted per gram of sieve value from about 20 to 25.

17. The process of claim 1, wherein a selectivity of the mixed catalyst particles is maintained at above an average prime olefin selectivity value of 72.0%.

18. The process of claim 1, wherein a selectivity of the mixed catalyst particles is maintained within 1% of an average prime olefin selectivity value for a sample of catalyst particles that does not contain deactivated catalyst.

19. The process of claim 1, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is at least 5% of the mass flow rate of the coked catalyst particles.

20. The process of claim 1, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is from about 20% to 100% of the mass flow rate of the coked catalyst particles at mixing.

21. The process of claim 1, wherein the regenerated catalyst particles are flowed at a mass flow rate that is from about 30% to 50% of the mass flow rate of the coked catalyst particles at mixing.

22. The process of claim 1, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing at least 1 mole percent of an oxygen-containing gas.

23. The process of claim 22, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing from about 5 mole percent to about 20 mole percent of the oxygen-containing gas.

24. The process of claim 22, wherein the oxygen-containing gas is steam.

25. A process for protecting catalytic activity of a silicoaluminophosphate molecular sieve, comprising the steps of:

a) regenerating catalyst particles that contain silicoaluminophosphate molecular sieve;

b) cooling the regenerated catalyst particles; and

c) mixing the regenerated catalyst particles with coked catalyst particles having a coke level of at least 2% by weight relative to a weight of molecular sieve material within the coked catalyst particles to maintain a catalytic activity of the additional catalyst particles at above 80% conversion of methanol at a cumulative grams of methanol converted per gram of sieve value of 5.

26. The process of claim 25, wherein the regenerated catalyst particles are cooled by injecting steam into the regenerated catalyst particles.

27. The process of claim 25, wherein the regenerated catalyst particles are mixed at a temperature of less than 550°C.

28. The process of claim 25, wherein the regenerated catalyst particles are mixed at a temperature from about 400°C to about 550°C.

29. The process of claim 25, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing at least 1 mole percent of an oxygen-containing gas.

30. The process of claim 29, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing from about 5 mole percent to about 20 mole percent of the oxygen-containing gas.

31. The process of claim 29, wherein the oxygen-containing gas is steam.

32. The process of claim 25, wherein the coked catalyst particles contain from about 2% to about 18% coke by weight relative to the weight of molecular sieve material within the coked catalyst particles.

33. The process of claim 25, wherein the coked catalyst particles contain from about 7% to about 13% coke by weight relative to a weight of molecular sieve material within the coked catalyst particles.

34. The process of claim 25, wherein the regenerated catalyst particles contain less than 0.2% coke by weight relative to a weight of molecular sieve material within the regenerated catalyst particles.

35. The process of claim 25, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is at least 5% of a mass flow rate of the coked catalyst particles.

36. The process of claim 25, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is from about 20% to 100% of a mass flow rate of the coked catalyst particles at mixing.

37. The process of claim 25, wherein the regenerated catalyst particles are flowed at a mass flow rate that is from about 30% to 50% of a mass flow rate of the coked catalyst particles at mixing.

38. A process for forming polyolefins, comprising:

a) converting an oxygenate feedstock into olefins by exposing the oxygenate feedstock to silicoaluminophosphate molecular sieve catalyst particles;

b) regenerating silicoaluminophosphate molecular sieve catalyst particles to contain less than about 1% coke by weight relative to a weight of molecular sieve material within the regenerated catalyst particles;

c) mixing the regenerated silicoaluminophosphate molecular sieve catalyst particles with coked catalyst particles containing at least 2% coke by weight relative to a weight of molecular sieve material within the coked catalyst particles to maintain the catalytic activity of the mixed catalyst particles at a predetermined level; and

d) forming polyolefins from the converted olefins.

39. The process of claim 38, wherein the regenerated catalyst particles are mixed at a temperature of less than 550°C.

40. The process of claim 38, wherein the regenerated catalyst particles are mixed at a temperature from about 400°C to about 550°C.

41. The process of claim 38, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing at least 1 mole percent of an oxygen-containing gas.

42. The process of claim 41, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing from about 5 mole percent to about 20 mole percent of the oxygen-containing gas.

43. The process of claim 41, wherein the oxygen-containing gas is steam.

44. The process of claim 38, wherein the coked catalyst particles contain from about 2% to about 18% coke by weight relative to the weight of molecular sieve material within the coked catalyst particles.

45. The process of claim 38, wherein the coked catalyst particles contain from about 7% to about 13% coke by weight relative to a weight of molecular sieve material within the coked catalyst particles.

46. The process of claim 38, wherein the regenerated catalyst particles contain less than 0.2% coke by weight relative to a weight of molecular sieve material within the regenerated catalyst particles.

47. The process of claim 38, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is at least 10% of the mass flow rate of the coked catalyst particles.

48. The process of claim 38, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is from about 20% to 100% of the mass flow rate of the coked catalyst particles at mixing.

49. The process of claim 38, wherein the regenerated catalyst particles are flowed at a mass flow rate that is from about 30% to 50% of the mass flow rate of the coked catalyst particles at mixing.

50. A process for protecting catalytic activity of a silicoaluminophosphate molecular sieve, comprising the steps of:

a) regenerating silicoaluminophosphate molecular sieve catalyst particles to contain less than about 1% coke by weight relative to a weight of molecular sieve material within the regenerated catalyst particles in a regenerator containing a stoichiometric excess of oxygen; and

b) mixing the regenerated catalyst particles with coked catalyst particles containing at least 2% coke by weight relative to a weight of molecular sieve material within the coked catalyst particles to maintain the catalytic activity of the mixed catalyst particles at a predetermined level.

51. The process of claim 50, wherein regenerating the silicoaluminophosphate molecular sieve catalyst particles further comprises producing a regeneration flue gas containing at least 0.2 mole percent of oxygen.

52. The process of claim 51, wherein the regeneration flue gas contains at least 1 mole percent of oxygen.

53. The process of claim 50, wherein the regenerated catalyst particles are mixed at a temperature of less than 550°C.

54. The process of claim 50, wherein the regenerated catalyst particles are mixed at a temperature from about 400°C to about 550°C.

55. The process of claim 50, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing at least 1 mole percent of an oxygen-containing gas.

56. The process of claim 55, wherein the regenerated catalyst particles are mixed with the coked catalyst particles in an atmosphere containing from about 5 mole percent to about 20 mole percent of the oxygen containing gas.

57. The process of claim 55, wherein the oxygen-containing gas is steam.

58. The process of claim 50, wherein the coked catalyst particles contain from about 2% to about 18% coke by weight relative to the weight of molecular sieve material within the coked catalyst particles.

59. The process of claim 50, wherein the coked catalyst particles contain from about 7% to about 13% coke by weight relative to a weight of molecular sieve material within the coked catalyst particles.

60. The process of claim 50, wherein the regenerated catalyst particles contain less than 0.2% coke by weight relative to a weight of molecular sieve material within the regenerated catalyst particles.

61. The process of claim 50, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is at least 5% of the mass flow rate of the coked catalyst particles.

62. The process of claim 50, wherein the regenerated catalyst particles are mixed with the coked catalyst particles at a mass flow rate that is from about 20% to 100% of the mass flow rate of the coked catalyst particles at mixing.

63. The process of claim 60, wherein the regenerated catalyst particles are flowed at a mass flow rate that is from about 30% to 50% of the mass flow rate of the coked catalyst particles at mixing.